U.S. ARMY RDECOM®
TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Open Campus Opportunities

ARL

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

U.S. Army Research Laboratory

as of February 14, 2014

CONTENT

INTRODUCTION

The mission of the U.S. Army Research Laboratory (ARL) is to provide innovative science, technology, and analyses to enable full spectrum Army operations. To execute this mission ARL leverages America's most substantial intellectual resource – its academic scientific research community. Formation of a collaborative and transparent relationship with this community through the Open Campus Program offers the prospect for effective execution of basic and applied research programs in a variety of technical focus areas of high Army interest.

ARL's Open Campus Program is a collaborative endeavor, whose goal is to position the laboratory to rapidly assume a leading role in burgeoning basic and applied research areas that hold significant promise for the Army. Through the Open Campus framework, ARL scientists and engineers (S&Es) will work collaboratively and side-by-side with visiting scientists on basic and applied research programs. The academic community and industry benefit from this arrangement through collaboration with ARL's world renowned research staff and unique technical facilities. Academic and industry collaborators will engage in high-impact research programs focused on providing the Warfighter with technological superiority in a broad array of technical areas.

ARL's technical portfolio encompasses a broad array of technical areas as well as technology maturity levels, from discovery of first recognized phenomena to innovative systems. This extensive, dynamic, and elaborate technical landscape offers many opportunities that can potentially lead to breakthroughs in science, technology, and analysis which radically change how today's Army and the Army of the future executes its mission.

THE OPEN CAMPUS CONCEPT

The concept of a defense laboratory was inspired by Thomas Edison's vision of "a great research laboratory" maintained by the Government. This vision led to the creation of the Naval Research Laboratory in 1923.[1] In 1945, Vannevar Bush's concepts documented in *Science: The Endless Frontier* became a model for how the United States would pursue its scientific endeavors.[2] Bush stressed the necessity for the establishment of a robust/synergistic university, industry, and government laboratory research system.[3] Over the past 60 years, organizational changes and consolidations have created the National Laboratories structure and a DoD research laboratory structure now known as the Defense Laboratory Enterprise (DLE).[4] However, the DoD research laboratory structure and operation have not changed since their establishment, while the university and industry research capabilities have evolved with the changing research and economic environments. This shift and the rigid and insular nature of the DLE have caused an erosion of the university/industry/government lab synergy that is vital to the discovery, innovation, and transition of science and technology critical to national security. In addition, the pace of technological change from 1990 to 2013 far exceeds the technology pace observed from 1950 to 1990 and will more than likely continue to increase beyond 2013. The current DLE is not positioned to meet or even keep pace with the future technological trends predicted over the coming decades. The globalization of technology requires novel and new collaboration mechanisms that will reenergize the university/industry/government lab synergy.

To address these challenges, ARL is adaptive and responsive to the challenges of 21st century national security. It is widely acknowledged that innovation depends on bringing multiple disciplines together to engage in collaborative projects that often yield unpredictable, but highly productive results. Formal and informal interactions among scientists lead to knowledge-building and research breakthroughs. By bringing together academia, industry and government, the Army can enhance its performance through onsite R&D collaboration. ARL will implement an open campus business model to foster better collaboration across industry, academia and government to leverage the best and brightest across the collective research community to more effectively produce transformative science and technology. Participation in ARL's Open Campus will provide ready access to world-renown facilities, researchers and resources for all partners including foreign nationals.

Currently, ARL seeks to attract academic and industry partners for the summer of 2014. This document outlines research areas where academic and industry scientists and engineers would collaborate alongside Army scientists and engineers in our facilities. These research areas are included in ARL's overarching campaign plan for Strategic Land Power Dominance for the Army of 2030 and beyond, based on eight subordinate technical campaigns—namely, Extramural Basic Research, Computational Sciences, Materials Sciences, Sciences-for-Maneuver, Information Sciences, Sciences-for-Lethality & Protection, Human Sciences, and Assessment & Analysis.

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[1] History of the Naval Research Laboratory. http://www.nrl.navy.mil/about-nrl/history/. 2013.
[2] Unlocking Our Future: Toward a New National Science Policy. U.S. House of Representative Committee on Science. 1998.
[3] Bush, Vannevar. *Science: The Endless Frontier, A Report to the President*. July 1945.
[4] Defense Laboratory Enterprise. http://www.acq.osd.mil/rd/laboratories/. 2013.

ARL LOCATIONS

ARL has five primary sites. Unique facilities at our primary sites provide our scientists and engineers access to world-class research centers.

Figure 1 ABERDEEN PROVING GROUND (APG), MD

Figure 2 ADELPHI LABORATORY CENTER (ALC), MD

Figure 3 WHITE SANDS MISSILE RANGE (WSMR), NM

Figure 4 RALEIGH-DURHAM, NC

Figure 5 ORLANDO, FL

ORGANIZATION OF THIS DOCUMENT

The first section describes technical areas, provides technical points of contact, and lists facilities associated with each. The latter part of the document lists separate opportunities for internships and post-doctoral positions. Points of contact are provided for each. The final section includes Frequently Asked Questions (FAQs).

RESEARCH AREAS

Extramural Basic Research

Extramural Basic Research is focused on steering and oversight of systematic studies to increase fundamental knowledge and understanding in physical, engineering, environmental, and life sciences related to long-term national security needs. A cornerstone of this campaign is collaborative research—synergistic basic and applied research consortia focused on addressing emerging as well as long-enduring technical challenges of unique Army interest. Exemplary of Army and DoD-relevant high-interest research areas supported through these efforts include biological sciences; nano-scale materials; neuroscience; multi-scale materials; and network sciences embodied through single investigator grants, Multi-disciplinary University Research Initiatives (MURIs), University Affiliated Research Centers (UARCs), and Cooperative Research Agreements (CRAs), and Cooperative Technology Agreements (CTAs).

Research areas for collaboration:

Network Science

Apply non-equilibrium statistical physics to complex networks.

POC: Bruce J. West bruce.j.west.civ@mail.mil (919) 549-4257

Computational Sciences

Computational Sciences is basic research and applied research focused on gaining a fundamental understanding of computer hardware, high-efficiency algorithms, and novel mathematical methods. Exemplary of Army and DoD-relevant high-interest research areas supported through these efforts include advanced computer architectures & algorithms; data & information extraction; analysis, fusion, and visualization; network science at the edge; intelligent software; and Big Data.

Research areas for collaboration:

Computational Fluid Dynamics (CFD)

Research in computational fluid dynamics, turbulence modeling, and grid generation is performed with emphasis on nonlinear and unsteady aerodynamics.

POC: Jubaraj Sahu jubaraj.sahu.civ@mail.mil (410) 306-0798

Computational Fluid Dynamics of Reacting Flows for Propulsion

CFD is used in detailed numerical models of high-pressure reacting flows including interior ballistics of guns, gun muzzle flow for blast/flash mitigation, and for rocket motor research. For success of the numerical models run on high-performance computers (HPCs), necessary inputs include detailed chemical kinetics and physical simulators for validation.

POCs: Richard Beyer richard.a.beyer10.civ@mail.mil (410) 278-6184
Michael Nusca michael.j.nusca.civ@mail.mil (410) 278-6108
Michael McQuaid michael.j.mcquaid.civ@mail.mil (410) 278-6185

Supporting Facility

Propulsion Science Branch Experimental Facilities **(APG)**

The Propulsion Science Branch has developed the capability to obtain data to validate our reacting CFD codes related to gun propulsion. High-pressure environments including research gun firings are safely accommodated. Novel experimental designs are developed as required.
Equipment Available: Ballistic simulators for acquisition of validation data for IB models. Optical diagnostics of chemistry, temperature, and pressure in muzzle flow field.

Heterogeneous Computing

This effort is focused on achieving high performance while using disparate processing core technologies. Algorithm design and software engineering approaches will be investigated to effectively partition and use binary processing cores to reduce time to solution for Army-relevant problems. Factors such as performance,

portability, and power will be considered. Develop new models to quantify computing capabilities in hybrid systems to facilitate algorithm signature mapping to available resources.

POC: Song Park song.j.park.civ@mail.mil (410) 278-5444

Meso- and Microscale Forecast Model Validation

Data from the Meterological Sensor Array (MSA) and other sources are being used to validate meso- and microscale numerical weather prediction (NWP) models at sub-kilometer grid resolutions. Model assessment tools developed by other organizations are being adapted, and various statistical analysis methodologies and Graphical Information Systems techniques are being employed to conduct the validations.

POC: John Raby john.w.raby2.civ@mail.mil
Theresa Foley theresa.a.foley.ctr@mail.mil (575) 678-2004

Supporting Facility

Meterological Sensor Array (MSA) (WSMR)

The MSA is a first-of-its-kind array of meteorological (Met) sensors designed to be emplaced to exactly overlay meso- and microscale forecast model grid points, enabling in-situ and remotely sensed Met observations that will more precisely assess and validate the accuracy of the models.
Equipment Available: Ten-meter Met towers with standard thermodynamic instrumentation; three-axis sonic anemometers; scintillometers; SODAR; triple LIDAR configuration.

Neurosynaptic Computing

Investigate the emerging topic of neurosynaptic computing that roughly mimics natural processing phenomena in the brain. Elaborate on and develop additional biologically based computing models and determine how binary processors based on this design could be used for neurocognitive applications within the Army sphere of interest.

POC: Manny Vindiola manuel.m.vindiola.civ@mail.mil (410) 278-9151

Novel Applications for Advanced and Tactical High-Performance Computing

Research and develop new capabilities for Soldiers based on mobile and tactical High-Performance Computing (HPC). Focus on novel real-time processing capabilities to reduce network load and increase Soldier effectiveness. Areas of interest include line-of-sight-related processing, electronics warfare, vehicle navigation, etc.

POC: Song Park song.j.park.civ@mail.mil (410) 278-5444

Quantum Computing

Investigate the use of adiabatic quantum computing and annealing for NP-Hard MAXSAT reducible problems. Investigate the use of both adiabatic algorithms and algorithms adhering to the quantum circuit model for classes of problems spanning optimization algorithms to quantum networking and quantum routers.

POC: Dale Shires dale.r.shires.civ@mail.mil (410) 278-5006

Virtual Worlds

Research into modeling all aspects of Massively Multiple Online Gaming (MMOG). ARL has an in-house laboratory supporting virtual world research. Potential mentors include Dr. Finkelstein,Tami Griffith, and Doug Maxwell.

POC: Tami Griffith tammi.griffith@us.army.mil (407) 384-3636

Materials Research

Materials Research is basic and applied research focused on gaining a fundamental understanding of structural, electronic, photonic, and energy materials & devices. Exemplary of Army and DoD-relevant high-interest research areas supported through these efforts include multifunctional materials; high field responsive materials; hierarchically designed & fabricated materials; semiconductor materials & devices; generation-after-next electronics; and synthetic biology.

Research areas for collaboration:

Aperiodic to Nanostructured Materials

Research based on experimental, computational, and analytic solutions relates to the design and thermal stabilization of metastable materials; specific focus is on the effective utilization and exploitation of nanostructured materials via discovery of new compositions and/or defect and interface engineering such as novel multiphasic solvent-solute combinations, augmented with grain size reduction and grain boundary modification techniques. Approaches entail the use of thermodynamic and kinetic principles to develop materials with unprecedented or greatly improved mechanical, thermal, or chemical properties.

POC: Kristopher Darling kristopher.darling.civ@mail.mil (410) 306-0862

Supporting Facility

Atmospheric Plasma Modification Laboratory (APG)

Laboratories to perform atmospheric and low vacuum plasma modification of materials. Laboratories to characterize the modification of such materials.

Equipment Available: Plasma Jet, plasma roll to roll, Kratos XPS, Nicolet FTIR, contact angle goniometer, Hitachi SEMs, planar atmospheric plasma system, plasma-enhanced chemical vapor deposition.

Atmospheric Plasma Modification of Materials

R&D to modify the surface of materials using plasma to improve adhesion, reduce defects, kill microorganisms, etc., without affecting bulk properties.

POC: Andres Bujanda andres.a.bujanda.civ@mail.mil (410) 306-0680

Supporting Facility

Atmospheric Plasma Modification Laboratory (APG)

Laboratories to perform atmospheric and low vacuum plasma modification of materials. Laboratories to characterize the modification of such materials.

Equipment Available: Plasma Jet, plasma roll to roll, Kratos XPS, Nicolet FTIR, contact angle goniometer, Hitachi SEMs, planar atmospheric plasma system, plasma enhanced chemical vapor deposition.

Chemical Agent Resistant Coatings (CARC) Development

New agents and new analysis of CARC shows that CARC has more vulnerabilities than previously known. As a result, work is needed to be able to understand why some coatings formulations are resistant to some chemical agents and why some fail vs. the same or other agents.

POCs: John Escarseg john.a.escarsega.civ@mail.mil (410) 306-0693
John La Scala john.j.lascala.civ@mail.mil (410) 306-0687

Supporting Facility

Coatings Suite and Materials and Manufacturing Sciences Division (MMSD) Laboratories (APG)

Laboratories to formulate and characterize coatings components and the properties and performance of coatings.

Equipment Available: spray hoods, elcometer, profilometer, contact angle goniometer, high-speed mixers, Varian FTIR, Atlas weatherometers, QUVs, Bruker AFMs, Hitachi SEMs, NEC 1.7 Megavolt Ion Accelerator.

Corrosion

Perform fundamental corrosion research at the micro/nano scale. Use and develop new techniques to analyze and understand corrosion at micro/nano scale that could be used to potentially mitigate corrosion.

POC: Joseph Labukas joseph.p.labukas.civ@mail.mil (410) 306-4939

Supporting Facility

Corrosion Micro/Nano Research (APG)

Laboratories to induce and examine corrosion at the macro through nano scale.

Equipment Available: EIS, CV, accelerated corrosion chambers, Electrochemical AFM, Scanning Kelvin Probe Microscopy, scanning electrochemical microscopy, Hitachi SEM, EDAX, NEC 1.7 Megavolt Ion Accelerator.

Corrosion

Corrosion of organic molecules to initiate desired breakdown or synthesis. This especially includes the desired breakdown of coatings to monomers to be able to more effectively recycle components for sustainable use of coatings.

POC: Joseph Labukas joseph.p.labukas.civ@mail.mil (410) 306-4939

Supporting Facility

Electrochemical Breakdown or Synthesis of Organic Molecules (APG)

Laboratories to induce and examine corrosion at the macro through nano scale and to characterize organic molecules, including polymers.

Equipment Available: Thinky Mixer, Nicolet FTIR, TA Q800 DMAs, DSCs, TGAs, TMAs, AR1000 Rheometer, Hitachi SEM.

Deformation Processing of Lightweight Materials

Severe plastic deformation processing of novel materials entails the top-down refinement of coarse-grained microstructures to the ultra-fine and nanoscale regime, resulting in a dramatic improvement in strength without a loss of ductility. Methodologies include equal channel angular extrusion, high-pressure torsion, accumulative roll bonding, friction stir welding, and processing to create material systems with controlled properties such as texture, morphology, and unique or metastable phase chemistries.

POC: Kevin Doherty kevin.doherty18.civ@mail.mil (410) 306-0871

Supporting Facility

Severe Plastic Deformation Processing Laboratory (APG)

Equipment Available: Equal Channel Angular Extrusion Press; Plate and Bar Tooling Geometries; Friction Stir Processing Capability.

Detonation Science

Investigation of reactive rate for CHNO compounds.

POC: Kevin McNesby Kevin.l.mcnesby.civ@mail.mil (410) 306 - 1383

Supporting Facility

Detonation Science Facility (APG)

Energetic Materials Characterization

Equipment Available: high-speed cameras, detonation chambers, Schlerin imaging.

Disruptive Energetics

Discovery and inventions of novel energetic materials. Methodologies for discovery include chemical synthesis, mechanochemical synthesis, and high-pressure chemistry and physics. The research area also focuses on investigating novel and efficient energy release concepts.

POC: Nirupam Trivedi nirupam.j.trivedi.civ@mail.mil (410) 306-3108

Supporting Facility

High-Pressure Synthesis/Laser Diagnostic Lab (APG)

Equipment Available: Paris-Edinburg Press, Diamond Anvil Press, various laser equipment.

Growth of III-V-Nitride Materials and Devices

Growth of materials and device structures targeting sources and detectors operating in the spectral region from ultraviolet to terahertz, using 2 Molecular Beam Epitaxy facilities uniquely configured for high-temperature growth (> 1100 C) and with novel sources (Boron, Be, Nd) and a custom metal-organic chemical vapor deposition (MOCVD) system.

POCs: Anand Sampath anand.v.sampath.civ@mail.mil (301) 394-0104
Michael Wraback michael.wraback.civ@mail.mil (301) 394-1459
Meredith Reed meredith.l.reed.civ@mail.mil (301) 394-0603

High-Performing Bio-Based Polymers

Petroleum-based polymers are not sustainable. Lignin, cellulose, carbohydrates, triglycerides, other renewable feedstocks, and green chemistry represent a sustainable source to generate monomers and polymers; development can result in innovation, resulting in chemical and material advances that would not otherwise come to fruition. Thus, we are developing novel polymers from renewable resources to replace petroleum-derived high-performance polymers for Army applications from fabric for uniforms to high-strength fibers for armor.

POC: John La Scala john.j.lascala.civ@mail.mil (410) 306-0687

Supporting Facility

Polymer Preparation and Characterization Laboratories and MMSD Laboratories (APG)

Laboratories to chemically prepare and characterize monomers and polymers, laboratories to formulate and compound polymers, laboratories to evaluate thermal and mechanical properties of polymers.

Equipment Available: Bruker 600 MHz NMR, picospin NMR, fume hoods, GC, Thinky Mixer, Nicolet FTIR, TA Q800 DMAs, DSCs, TGAs, TMAs, AR1000 Rheometer, Hitachi SEM, Instron mechanical testing laboratories.

Materials Manufacturing & Processing Science

Cryogenic Processing of Nano-Materials.

POC: Kyu Cho kyu.c.cho2.civ@mail.mil (410) 306-0820

Supporting Facility

Cryogenic Processing Research Facility (APG)

Conduct cryogenic manufacturing and processing of nano-materials.

Equipment Available: Cryogenic (liquid nitrogen) Attritor, Glove Box evaporator, power degassing unit.

Materials State Awareness for Aviation Sustainment

Develop embedding sensing capability for military aircraft composite structures to identify, characterize, and categorize specific materials damage precursors that can be used to predict failure of aircraft structures prior to the onset of actual damages.

POC: Asha Hall asha.j.hall.civ@mail.mil (410) 278-8036

Multi-Scale Reactive Modeling for Energetics

Theoretical Modeling and Simulations of Energetic Materials in order to understand the structure-property and structure-phenomenological responses of Energetics. The program focuses on building models from Quantum Mechanical to Micro- to Meso- to Continuum scale with emphasis on building the models that bridge the length scales.

POC: Betsy Rice betsy.rice.civ@mail.mil (410) 306-1904

Phonon Dynamics and Transport in Condensed Matter

Femtosecond ultrasonics and thermoreflectance studies of phonon transport across interfaces, elastic properties, and phonon attenuation; pump-probe studies of interaction between electronic and phonon excitations.

POC: Michael Wraback michael.wraback.civ@mail.mil (301) 394-1459

Supporting Facility

Femtosecond Pump-Probe Laboratory (ALC)

Femtosecond ultrasonics and thermoreflectance studies of phonon transport across interfaces, elastic properties, and phonon attenuation; pump-probe studies of interaction between electronic and phonon excitations.

Equipment Available: Light source includes femtosecond Coherent RegA pumped-optical parametric amplifier (OPA) tunable from UV through IR wavelengths; femtosecond Spectra-Physics Tsunami pumped-inspire high-repetition rate oscillator system tunable from visible through infrared wavelengths.

Physics of Quantum Phenomena

Investigate quantum phenomenon in semiconductor-light interactions for applications in quantum information using coherence spectroscopy. Strong collaborations with ARL theorists.

POC:	Michael Wraback	michael.wraback.civ@mail.mil	(301) 394- 1459
	Gregory Garrett	gregory.a.garrett.civ@mail.mil	(301) 394-1966
	Grace Metcalfe	grace.d.metcalfe.civ@mail.mil	(301) 394-2864

Supporting Facility

Coherent Spectroscopy Laboratory (ALC)

Four-wave mixing techniques including pump-probe spectroscopy, differential reflection/transmission, and photon echo.

Equipment Available: Light source includes femtosecond Spectra-Physics Tsunami pumped-inspire high-repetition rate oscillator system tunable from visible through infrared wavelengths.

Semiconductor Physics (Vis-NIR through Terahertz)

Investigate carrier dynamics and transport in semiconductor materials used in optoelectronic devices, such as infrared (IR) detectors, solar cells, and liquid/semiconductor junctions using unique Vis/near-IR through terahertz (THz) ultrafast spectroscopy in combination with modeling and data analysis.

POC:	Michael Wraback	michael.wraback.civ@mail.mil	(301) 394-1459
	Grace Metcalfe	grace.d.metcalfe.civ@mail.mil	(301) 394-2864

Supporting Facility

Visible, Near-Infrared (IR), and Terahertz (THz) Spectroscopy Laboratories (ALC)

Time-resolved photoluminescence in ranges including near IR, Medium-Wave Infared (MWIR) (3-5 microns) and Long-Wave Infared (LWIR) (8-10 microns), time-resolved THz spectroscopy, pump-probe

spectroscopy with tunable pulses between 400 nm and 10000 nm, combined pump-probe and THz spectroscopy, continuous-wave THz spectroscopy with tunabilty from 0.09 THz to 1.2 THz.
Equipment Available: Light source includes femtosecond Coherent RegA pumped-OPA tunable from visible through long-wave infrared wavelengths; custom-built continuous-wave THz spectroscopy facility containing sample cells with path lengths from 0.5 m to 9.5 m, and multiple photomixer/Schottky diode sources and detectors to control spectral resolution and tunable range, including coherent heterodyne detection.

Structural Materials for Improved Vehicle Mobility and Stealth

Research multifunctional structural materials capable of storing or harvesting energy in pursuit of increased vehicle range and concealed vehicle location.

POC: Mark Bundy mark.l.bundy2.civ@mail.mil (410) 278-4318

Ultrafast Spectroscopy of Electronic, Optoelectronic, & Structural Materials

Femtosecond spectroscopy with ultrashort pulses tunable from 200 nm to 10000 nm, probing dynamics, and transport of electronic and phonon excitations in condensed matter.

POC: Michael Wraback michael.wraback.civ@mail.mil (301) 394-1459

Supporting Facility

Ultrafast Spectroscopy Laboratories (ALC)

Multiple laboratories providing femtosecond spectroscopy with lasers continuously tunable from 200 nm to 10000 nm.

Wide Band Gap Semiconductor Physics

Investigate carrier dynamics and transport in semiconductor materials used in light-emitting devices, such as light-emitting diodes (LEDs) and lasers, and photodetectors and energy conversion devices operating in the ultraviolet (UV) through visible spectral range using unique UV-visible ultrafast spectroscopy facility, in conjunction with modeling and data analysis.

POC: Michael Wraback michael.wraback.civ@mail.mil (301) 394- 1459
Gregory Garrett gregory.a.garrett.civ@mail.mil (301) 394-1966

Supporting Facility

Ultraviolet (UV)-Visible Spectroscopy Laboratory (ALC)

UV (200-400 nm)-visible time-resolved photoluminescence including unique sub-picosecond optical gating, time-correlated single photon counting, and synchronous-scan streak camera. Continuous-wave photoluminescence. Femtosecond pump-probe spectroscopy with tunable UV pump and probe pulses.

Equipment Available: Light source includes femtosecond Coherent RegA pumped-optical parametric amplifier (OPA) tunable from UV through visible wavelengths, and high brightness, broadband, continuous-wave energetic laser-driven UV light source.

Sciences for Maneuver

The Sciences for Maneuver area is focused on gaining a fundamental understanding of advanced mobility systems and their supporting architectures. This area heavily relies on ARL's research expertise and facilities devoted to decision support sciences, autonomy, and high-efficiency energy generation, storage, and distribution. Discoveries, innovations, and developments made in this area are expected to significantly impact the Army of the future by greatly enhancing mobility.

Research areas for collaboration:

Autonomy and Collaboration

Develop novel techniques that enable the teaming of autonomous systems with Soldiers. These behaviors include autonomous 3D mapping, positioning, and exploration in urban environments; heterogeneous teaming; and semantic scene and activity understanding.

POC: Stuart Young stuart.h.young.civ@mail.mil (301) 394-5618

Ground Vehicle Structural Mechanics and Dynamics Technology

Establish and evaluate non-linear control algorithms for active and semi-active dynamic systems, and establish non-linear modeling and simulation capabilities to address ground vehicle crashworthiness and Soldier protection.

POC: Muthuvel Murugan muthuvel.murugan.civ@mail.mil (410) 278-7903

Supporting Facility

Structural Integrity Laboratory (APG)

Equipment Available: LS-DYNA software, MADYMO; dSpace software license; suspension test rig; electromagnetic high speed damper tester; drop tower seat testing setup; HIII Crash dummies; Altair HyperWorks.

Information Sciences

The Information Sciences area is focused on gaining a fundamental understanding of information generation, collection, assurance, distribution, and exploitation; high-performance electronic components and devices; and synthetic biological systems. This area heavily relies on ARL's research expertise and facilities in network science; decision support sciences; electronic & information warfare vulnerability; electronic materials synthesis, component fabrication, and device characterization; and manipulation of synthetic biological systems. Discoveries and innovations made in this area are expected to exert a significant impact on the Army embodied as improved sensing capabilities, improved tactical networks, improved commander's decision support aids, and robust computational resources leading to information supremacy.

Research areas for collaboration:

Bio-Aerosols Isolation and Characterization

Individual bio-aerosol particles are isolated and trapped using laser-induced photophoretic forces. Methods are under development to fully determine fluorescence, Raman and thermal emission, and elastic scattering from the trapped particles, extracting detailed characteristics of the aerosols from relatively limited measurements.

POC:	Yongle Pan	yongle.pan.civ@mail.mil	(301) 394-1381
	Steven Hill	steven.c.hill32.civ@mail.mil	(301) 394-1813

Supporting Facility

Aerosol Research Facility (ARF) (ALC)

This facility is used to develop methods for the detection, trapping, and characterization of atmospheric aerosols, dust, haze, and other battlefield obscurants. The ARF provides physical, chemical, and biological characterization; optical cross sections; and spectral signatures of the aerosols.
Equipment Available: polarimetric imager, nephelometers, specially tuned laser.

Cloudlet-Based Processing

Develop optimization approaches to allow for self-forming "cloudlet"-based processing configurations with HPC assets providing key processing and offloading support for constrained hand-held devices. Develop models to account for network connectivity and offered computing load as mapped to a dynamic computing infrastructure (computing capacity). Develop new methodologies or apply existing concepts related to scheduling to achieve balance in transient and unstable networks common in Army operational realms.

POC:	David Bruno	david.l.bruno4.civ@mail.mil	(410) 278-8929

Domain-Specific Languages

Perform research into the utility of domain-specific languages to achieve high efficiency on advanced computing architectures to promote portability and longevity while reducing the burdens on computational scientists to develop software. Develop quantitative and qualitative assessment methodologies to assess performance.

POC: David Bruno david.l.bruno4.civ@mail.mil (410) 278-8929

Information Architectures

Develop agile, auto-adaptive data dissemination and extraction techniques for hybrid tactical networks to enable small unit situation understanding.

POC: Larry Tokarcik larry.j.tokarcik.civ@mail.mil (301) 394-5614

Natural Language Processing

This effort will focus on adaptive machine translation (MT) research using predictive modeling techniques that leverage lexical, syntactic, and semantic natural language processing (NLP) resources against large-scale, heterogeneous document collections.

POC: Melissa Holland virginia.m.holland6.civ@mail.mil (301) 394-3001

Network & Information Sciences

Quality of Information: development of foundational framework, including ties with semantic information theory; propagation of information in composite dynamic networks.

POC: Ananthram Swami ananthram.swami.civ@mail.mil (301) 394-2486
Greg Cirincione gregory.h.cirincione.civ@mail.mil (301) 394-4809

Supporting Facility

Mobile Network Modeling Institute (APG)

Facility for fine-grained simulation and emulation of communication networks.

Network & Information Sciences

Co-evolution of networks: development of empirical and theoretical models; tools for discovery, inference, prediction and control; experimental validation.

POC: Ananthram Swami ananthram.swami.civ@mail.mil (301) 394-2486

Supporting Facility

Network Science Research Laboratory (ALC)

Integrated framework for experimentation on networks.

Quantum Information Science

Investigate advanced tactical and long-range atmospheric laser communication and imaging technologies to achieve high-bandwidth communication and high-fidelity visualization. Investigate and develop novel processing techniques to provide tactically superior quantum imaging and battlefield communications particularly in obscured, obstructed, or adverse tactical environments.

POC: Ronald Meyers ronald.e.meyers6.civ@mail.mil (301) 394-2111

Sciences for Lethality & Protection

The Sciences for Lethality & Protection area is focused on gaining a fundamental understanding of armor, under body, scalable effects, cyber & electronic warfare, and human injury mechanisms. This area heavily relies on ARL's research expertise and facilities in lethality, impact physics, and ballistic vulnerability. Discoveries and innovations made in this area are expected to exert a significant impact on the Army of the future by greatly enhancing lethality, vehicle protection, and Warfighter protection.

Research areas for collaboration:

Dynamic Failure of Materials

Discover the underlying mechanisms associated with material fracture and failure that occur at very high loading rates, create engineering level models of the underlying mechanisms, and structure the models in a manner consistent for implementation into advanced computational mechanics codes.

POC: Todd Bjerke todd.w.bjerke2.civ@mail.mil (410) 278-5819

Supporting Facility

Dynamic Fracture Laboratory (APG)

High-rate loading device and state-of-the-art instrumentation to isolate and probe individual fracture/failure mechanisms.

Equipment Available: Gas gun, coherent gradient sensing device, high-powered laser, method of caustics, ultrafast 64 channel IR detector array for measuring thermal emissions furing propagating cracks, strain gages, Hadland cameras.

Flight Dynamics/Guidance, Navigation, and Control

Flight dynamics/guidance, navigation, and control of guided precision munitions with emphasis on development of new algorithms of novel guided munitions.

POC: Frank Fresconi frank.e.fresconi.civ@mail.mil (410) 306-0794

High-G Environment

Understanding and simulating a structural response to a high-acceleration environment are critical to the effective design of gun-launched projectiles.

POC: Morris Berman morris.berman@us.army.mil (301) 394-4188

Supporting Facility

High-G Environment Simulation Facility (ALC)

Laboratory creation of millisecond-duration high-g environments.
Equipment Available: 3" Airgun, 4" Airgun, 7" Airgun.

High-Rate Experimental Mechanics of Materials at Different Length Scales

Understanding the relationship between mechanical, electrical, and chemical response of materials to mechanical loading by identifying associated micro-mechanisms through quantitative in-situ visualization. Investigations to obtain the deformation and failure mechanisms at different loading rates for Army-relevant materials.

POC: Tusit Weerasooriya tusit.weerasooriya@us.army.mil (410) 306-0969

Humans in Extreme Environments

Understanding the mechanisms of Traumatic Brain Injury. Develop computational and experimental methods to characterize the human response to ballistic loading.

POC: Christopher Hoppel christopher.p.hoppel.civ@mail.mil (410) 278-8878

Supporting Facility

Multi-Scale Experimental Characterization of Biologic Materials (APG)

Methods to characterize the rate-dependent response of biological materials including Kolsky bars, test frames, and micro CT machines.

Low-Cost Hyper-Accurate Weapons

Research estimation and control algorithms while leveraging high-performance, low-power computing capabilities to solve complex engagement problems that are currently not feasible.

POC: Mark Ilg mark.d.ilg.civ@mail.mil (410) 306-0780

Supporting Facility

Guidance Navigation and Control Laboratory (GN&C) (APG)

Facility for developing GN&C systems for gun-launched munitions. Conduct hardware in-the-loop simulations and prototyping of guidance electronics and actuation systems.
Equipment Available: Sprient GNSS 8000 - Global Navigation Simulator; Antenna Characterization Chamber; Gun Shock Loading Table; MEMs IMU Calibration Equipment; Helmholtz Coil; Mechanical Prototyping Equipment; MyData PCB Assembly Equipment.

Modeling Development and Validation Via Novel Experimental Diagnostics

This work encompasses fundamental research in electromagnetism and solid mechanics. A close synergism between theory and experiment is continuously sought, and close collaboration between experimentalists and modelers is considered mandatory. The theoretical work can vary from largely analytical, which relies only on physics-based PC programs, to full-scale hydrocode simulations. The experimental work employs sophisticated diagnostics that can be used to measure electrical and thermodynamic properties for purposes of comparison with theory.

POC: Casey Uhlig willard.c.uhlig.civ@mail.mil (410) 278-3997

Supporting Facility

EM Laboratory and Experimental Ballistic Facilities (APG)

Experimental facilities with pulsed power production and measurement capabilities, and high-velocity impact events.

Equipment Available: Pulsed-power equipment, high-speed video (Photron, Phantom, Ultra 24, Shimatzu), video tracking, high-speed spectroscopic imaging.

Penetration Mechanics

High-velocity penetration into soft, brittle, and ductile materials. Fracture and failure behaviors.

POC: Jim Newill james.f.newill.civ@mail.mil (410) 278-6004

Supporting Facility

High-Velocity Impact Research Facility (APG)

Facility for studying the penetration behaviors of soft and hard targets, which are both brittle and ductile.

Equipment Available: Launchers, flash radiograph station.

Tactical Laser Systems

Tactical and long-range atmospheric imaging, laser communications, and directed energy systems are under development. R&D includes: advanced hybrid parallel live image acquisition and processing based on adaptive optical and analog/digital computation; maximizing tactical directed-energy laser beam irradiance through adaptive coherent beam combining and control techniques; and mitigation and adaptive turbulence correction in long-range atmospheric propagation for laser communication and directed energy weapon systems.

POC: Jony Jiang Liu jony.j.liu.civ@mail.mil (301) 394-1442

Supporting Facility

Intelligent Optics Laboratory (IOL) (ALC)

The IOL is equipped to support sophisticated investigations in adaptive and nonlinear optics, advanced imaging and image processing, and laser communications for ground-to-ground and other applications. A variety of state-of-the-art adaptive optics, wave front diagnostics, and image processing tools are used to support advanced techniques for simulation, imaging, and laser communication system performance.

Science of Cyber Security

Develop a fundamental understanding of cyber phenomena, including aspects of human attackers, cyber defenders, and end users, so that fundamental laws, theories, and theoretically grounded and empirically validated models can be applied to a broad range of Army domains, applications, and environments.

POC:	Ananthram Swami	ananthram.swami.civ@mail.mil	(301) 394-2486
	Alex Kott	alexander.kott1.civ@mail.mil	(301) 394-1507

Supporting Facility

Cyber Lab (ALC)

Live test bed for monitoring, collection and testing of computer networks.

Human Sciences

The Human Sciences area is focused on gaining a fundamental understanding of Warfighter performance enhancement; training aids; man-machine integration; group formation, dynamics, and behaviors; trust and influence; and technology impacts on cultures & society. This area heavily relies on ARL's research expertise and facilities in Soldier performance, simulation and training technologies, and human systems integration. Discoveries, innovations, and developments made in this area are expected to exert a significant impact on the Army of the future by greatly enhancing Soldier performance across all Army occupational specialties.

Research areas for collaboration:

Adaptive Tutoring

Investigate methods to enable computer-based tutoring systems to adapt instruction based on learner states (cognitive, affective, and competence). Experimentally assess learner state variables (self-reported, observed, physiological, and behavioral) to accurately model the learner's cognitive / affective state and adapt content and interactions to meet learner needs. The Learning in Intelligent Tutoring Environments (LITE) Laboratory supports a wide range of research into adaptive tutoring. There is one current postdoc student working in this technology area. Potential mentors include Dr. Robert Sottilare, Dr. Heather Holden, Dr. Keith Brawner, and Dr. Ben Goldberg.

POC: Dr. Robert Sottilare robert.sottilare@us.army.mil (407) 384-3007

Advanced Simulation

The purpose of the Soldier-Centered Army Learning Environment (SCALE) is to research and prototype a technology-enabled, data-driven learning environment for integrated training across multiple platforms (personal computers, mobile devices, games, virtual worlds, social media, and classroom teaching methods). Research is conducted to determine how and when Soldiers learn best in collaborative environments and to assess performances; capture and share individual expertise and lessons learned; and develop user-friendly authoring tools that support rapid development of content across several platforms. ARL has a lab supporting this research area. Potential mentors include Chris Gaughan and Chris Metevier.

POC: Chris Gaughan chris.gaughan@us.army.mil (407) 384-3323

Bone Conduction (BC) Perception and Communication Systems

Analyze sound pathways, brain response, and/or factors that influence bone conduction effectiveness. Examine BC in novel contexts. Improve devices and mounting systems.

POC: Kimberly Pollard kimberly.a.pollard.civ@mail.mil (410) 278-5842

Brain Structure Function Coupling

Develop multiscale understanding of the relationship between the brain's physical structure, its dynamic electrochemical functioning, and human behavior.

POC: Jean Vettel jean.m.vettel.civ@mail.mil (410) 278-7431

Dismounted Soldiers

Conduct research into technologies to blend live and virtual training simulations. Research technologies include virtual locomotion, avatar group behaviors, visual stimulates, positioning sensors, artificial intelligence, and see-through helmet-mounted displays. ARL has a Dismounted Soldiers lab that supports this research area. Internship mentors are Pat Garrity and Frank Dean.

POC: Pat Garrity pat.garrity@us.army.mil (407) 384-3663
Frank Dean frank.dean@us.army.mil (407) 384-3877

Human-Robot Interaction

This research area is of critical importance to the Army for its understanding of the complexities and dynamics of human interaction with unmanned systems across domains (e.g., land, air) and capability levels (e.g., autonomy, manual control). We are developing programs to carry out fundamental research involving complex equipment, emerging technologies, and scientific phenomena pertaining to humans and autonomous systems. The work applies methods and techniques of cognitive and experimental psychology, human factors engineering, and/or computer science to the understanding and solution of human factors issues involving unmanned systems across a range of military operations. The research will contribute to the development of theory, models, methods, and measures for understanding the interdependencies between the cognitive, social, information, and communication aspects of interaction with unmanned autonomous systems and ultimately to help align Soldier and system capabilities in real time to support effective performance across a broad spectrum of military operations.

POC: Susan Hill susan.g.hill.civ@mail.mil (410) 278-6237

Live Training Technologies

Conduct research into training and operational simulations in the Army Live Training Domain. Technologies being researched include hybrid position and navigation sensors, next-generation lasers, embedded simulations in operational systems, enemy predictive technologies, micro-cloud architectures, and tracking technologies inside structures. A laser lab supports this research area. Potential mentors are Frank Tucker and Bonnie Eifert.

POC: Frank Tucker frank.tucker@us.army.mil (407) 384-5448
Bonnie Eifert latika.effert@us.army.mil (407) 384-5338

Manned-Unmanned Collaborative Teaming

Investigate factors that determine effective teams, decision making, and performance, specifically for manned/unmanned teams in ground and aviation systems.

POC: Tom Davis thomas.w.davis.civ@mail.mil (256) 876-2048

Supporting Facility

Manned-Unmanned Systems Integration Laboratory (Huntsville, AL)

Manned-Unmanned Collaborative Teaming Laboratory dedicated to investigating factors that impact teams and their decision making.

Equipment Available: Eight (8) networked distributed team workstations with virtual battle space, EEG and EKG monitoring, head motion and eye tracking, six-DOF Pholemus Motion Tracking.

Soldier Auditory Situation Awareness

Models of auditory detection, identification, and localization that incorporate communications devices and personal protective gear and inform design and development of such devices.

POC: Angélique Scharine angelique.a.scharine.civ@mail.mil (410) 278-5957

Soldier Performance - Interaction of Physical and Cognitive Performance

Perform research and analysis to understand the effects of physical and cognitive stress (and their interaction) on Soldier Performance in laboratory and dismounted operational environments.

POC: Michael LaFiandra michael.e.lafiandra.civ@mail.mil (410) 278-5973

Supporting Facility

Soldier Performance and Equipment Advanced Research Facility (APG)

Facility designed to impose and measure the effects of physical and cognitive stress on Soldier performance in a dismounted operational environment.

Equipment Available: 3000 sq-ft biomechanics lab with 12 camera motion capture system, 2 x 16 channel EMG systems, 2 portable oxygen consumption measurement devices, inertial measurement units, fully instrumented 500 meter obstacle course with 22 obstacles, WiFi network.

C4ISR Laboratory (APG)

Immersive environment for evaluating effects of cognitive stress on Soldier performance.

Equipment Available: Nine individual rooms (whisper rooms) each housing a large-screen monitor connected to a networked gaming system capable of allowing Soldier subjects in each room to interact in the virtual environment.

Tactical Environment Simulation Facility (TESF) (APG)

Immersive environment for evaluating effects of physical and cognitive stress on Soldier performance.
Equipment Available: Immersive cave (4 sides, completely enclosed CAVE) with OmniDirectional Treadmill (ODT) capable of immersing Soldier subjects in simulated environment and allowing them to walk freely in that environment.

Assessment and Analysis

The Assessment and Analysis Campaign Plan is focused on development and application of analytical tools and methodologies to quantitatively assess the military utility of Army, DoD, and select foreign combat systems. In addition to the development of novel assessment and analysis capabilities, knowledge and understanding drawn from ARL's other technical campaigns are leveraged to help influence requirements for future Army systems. Exemplary of Army and DoD-relevant high-interest areas supported through these efforts include ballistic effectiveness, personnel armor susceptibility; platform armor susceptibility; information systems vulnerability; system-of-systems analyses; and human performance enhancement assessment.

Research areas for collaboration:

Human System Integration - Modeling and Simulation

Research, develop, and apply human systems integration (HSI) techniques, tools, and technologies to ensure MANPRINT goals, constraints, and human performance measures are achieved.

POC:	Diane Mitchell	diane.k.mitchell.civ@mail.mil	(410) 278-5861
	Jock Grynovicki	jock.o.grynovicki.civ@mail.mil	(410) 278-5956

Supporting Facility

System Assessment and Usability Laboratory (SAUL) (APG)

Research, develop, and apply human systems integration (HSI) techniques, tools, and technologies to ensure MANPRINT goals, constraints, and human performance measures are achieved. Conduct MANPRINT assessments on graphical user interface (GUI). Execute usability studies on software user interfaces.

Equipment Available: HSI-Tools: IMPRINT enhanced with automation and library of activities and micromodels, Job Assessment Software System (JASS) to define and measure human aptitudes; MIL-STD-1472 Physical Accommodation Companion Software; C3TRACE - Command, Control, and Communication environment.

INTERNSHIP OPPORTUNITIES

Computational Sciences

Computational Fluid Dynamics

Research in computational fluid dynamics, turbulence modeling, and grid generation is performed with emphasis on nonlinear and unsteady aerodynamics (APG).

Mentor: Jubaraj Sahu jubaraj.sahu.civ@mail.mil (410) 306-0798

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Heterogeneous Computing

Benchmark Suite Development (APG)

ARL is developing a suite of parallel number-crunching benchmarks to evaluate and analyze the performance of heterogeneous computing systems. This includes software from the SHOC (Scalable Heterogeneous Computing) benchmark suite as well as home-developed codes and approaches using languages such as OpenCL. This project will involve developing several optimization strategies for benchmark kernels and developing canonical tests for performance.

Mentor: Jamie Infantolino jamie.k.infantolino.ctr@us.army.mil (410) 278-7121

Eligibility Restrictions: None

Meso- and Microscale Forecast Model Validation

Meteorological Sensor Array (MSA) (WSMR)

Data collected from the MSA will be statistically analyzed against results from numerical weather prediction models to assess their accuracy.

Mentor: Mr. Robert Dumais robert.e.dumais.civ@mail.mil (575) 678-4650
Ms. Gail Vaucher gail.t.vaucher.civ@mail.mil (575) 678-3237

Eligibility Restrictions: None

Novel Applications for Advanced and Tactical High-Performance Computing

Real-Time Operating Systems for GPU-Based Tactical HPC (APG)

Graphics Processing Units (GPUs) are accelerator technologies that can allow for large-scale number crunching in deployed footprints. While these processors have a large capacity, they were not engineered with general-purpose inclusion into deployed systems with real-time processing restrictions. This project will investigate the state-of-the-

art in incorporating this technology into deployed systems and suggest improvements in an Army-centric application.

Mentor: Mr. Song Park song.j.park.civ@mail.mil (410) 278-5444

Eligibility Restrictions: None

Virtual Worlds

Massively Multiple Online Gaming (MMOG) (Orlando, FL)

Research into modeling all aspects of Massively Multiple Online Gaming (MMOG).

Mentor: Tami Griffith tammi.griffith@us.army.mil (407)384-3636

Eligibility Restrictions: None

Materials Research

Aperiodic to Nanostructured Materials

Design and Thermal Stabilization of Metastable Materials (APG)

Use of Experimental and Computational approaches to thermodynamic and kinetic stabilization of novel materials.

Mentor: Kristopher Darling kristopher.darling.civ@mail.mil (410) 306-0862

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Atmospheric Plasma Modification of Materials

Atmospheric Plasma Modification of Materials (APG)

Research and development of novel, scalable methods to modify and deposit thin coatings on materials surfaces using plasma-assisted wet chemistry and spray deposition techniques. Material analysis techniques including SEM, XPS, contact angle goniometry, FTIR, XRD, and tensile strength testing will be employed. The work involves the development and characterization of novel polymers/fibers, polymer blends/hybrids, nanomaterials, new process methods for applying or modifying polymers to increase service life, environmental durability, and providing chemical-biological protection/detection and/or ballistic protection. The incumbent should have technical publications showing the ability to develop new coating formulations and have demonstrated success in working within a team of scientists. Position involves developing experimental and theoretical work to explore the potential of applying plasma technology to the growth of thin, conformal, multifunctional coatings for Army applications and to produce technical reporting of findings.

Mentor: Andres Bujanda andres.a.bujanda.civ@mail.mil (410) 306-0680

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Chemical Agent Resistant Coatings (CARC) Development

Coatings Fundamental Research (APG)

Researcher will provide fundamental research and analysis to support the research and development of coatings, understanding of the chemical resistance of coatings, reducing the environmental footprint, and reducing materials degradation/corrosion. Formulate epoxy, polyurethane, and other thermosetting materials for use as coatings. Characterize thermosetting resins for chemical resistance via PALS, solvent absorption, and other studies. Characterize thermal and mechanical analysis of organic-based films and coatings. Formulate and prepare model coatings and coatings for Army applications using thermosetting resin binders. Provide expert analysis of product performance and characteristics through various instrumental methods. Develop structure/property relationships for coatings materials via measurement of material properties and analysis of chemical, nano, and micro-structure using tools such as dynamic mechanical analysis (DMA/DMTA), differential scanning calorimetry (DSC), positron annihilation spectroscopy (PALS), infrared spectroscopy (IR), microscopy, and scanning electron microscopy (SEM). Conduct performance testing of coatings according to military specifications and related ASTM protocols. Develop improvements for quality of applications, products, and/or procedures. Formulate and evaluate camouflage coatings and related epoxy coatings used to extend life cycles of coating performance. Formulate improved coatings for resistance to chemical infiltration/absorption, resistance to degradation, mitigation of corrosion, and reduction in environmental footprint. Evaluate materials for corrosion resistance using accelerated weathering techniques and coatings evaluation techniques, including electrical impedance spectroscopy (EIS).

Mentor: POC: John Escarsega john.a.escarsega.civ@mail.mil (410) 306-0690
John La Scala john.j.lascala.civ@mail.mil (410) 306-0687

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Corrosion

Corrosion Micro/Nano Research (APG)

Perform fundamental corrosion research at the micro/nano scale. Use and develop new techniques to analyze and understand corrosion at micro/nano scale that could be used to potentially mitigate corrosion.

Mentor: Joseph Labukas joseph.p.labukas.civ@mail.mil (410) 306-4939

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Electrochemical Breakdown or Synthesis of Organic Molecules (APG)

Corrosion of organic molecules to initiate desired breakdown or synthesis. This especially includes the desired breakdown of coatings to monomers to be able to more effectively recycle components for sustainable use of coatings.

Mentor: Joseph Labukas joseph.p.labukas.civ@mail.mil (410) 306-4939

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Deformation Processing of Lightweight Materials

Severe Plastic Deformation Processing of Novel Materials (APG)

Equal channel angular extrusion, friction stir, and surface mechanical attrition treatment processing methodologies to impart metals and alloy with improved properties.

Mentor: Kevin Doherty kevin.doherty18.civ@mail.mil (410) 306-0871

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Detonation Science

High-Speed Diagnostics (APG)

Experimental techniques to characterize the reaction of energetic materials when subjected to shock.

Mentor: Matt Biss matthew.m.biss.civ@mail.mil (410) 278-3708

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Disruptive Energetics

High-Pressure Synthesis (APG)

Discovery and inventions of novel energetic materials. Methodologies for discovery include mechanochemical synthesis and high-pressure chemistry and physics.

Mentor: Jennifer Ciezak-Jenkins jennifer.a.ciezak-jenkins.civ@mail.mil (410) 278-6169

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Growth of III-V-Nitride Materials and Devices

Novel Transparent Hole Injection Schemes for UV Emitters (ALC)

Investigate the incorporation of novel impurity and polarization-enhanced doping schemes to simultaneously improve hole injection and UV extraction efficiency.

Mentor: Anand Sampath anand.v.sampath.civ@mail.mil (301) 394-0104
Eligibility Restrictions: None

High-Temperature MBE Growth Dynamics (ALC)
Investigate the dynamics of group III adlayer formation, surface mobility, and adsorption, as well as impurity incorporation in III-N material growth at high growth temperatures comparable to those employed for commercial MOCVD processes.
Mentor: Anand Sampath anand.v.sampath.civ@mail.mil (301) 394-0104
Eligibility Restrictions: None

Rare Earth Doped III-Nitride Heterostructure Materials and Devices (ALC)
Investigate the incorporation of rare earth ions into III-Nitride heterostructures and diodes and the impact of large tunable electric fields on the optical properties of the rare earth ions.
Mentor: Anand Sampath anand.v.sampath.civ@mail.mil (301) 394-0104
Eligibility Restrictions: None

High-Performing Bio-Based Polymers

High-Performing Bio-Based Polymers (APG)
The primary focus of the researcher would be to chemically prepare monomers, thermoplastic, and thermosetting polymers from biological sources. The researcher would use chemical synthetic techniques to prepare the monomers. We are looking for candidates with experience in synthesis of small molecules, scale-up of reactions to moderate sizes (~100 g), and purification of products. The researcher would then use analytical tools and instrumentation, such as titration methods, NMR, FTIR, and GPC, to characterize the resulting chemicals and monomers. The researcher would polymerize the monomers using common and novel techniques and characterize various properties of the polymers, including molecular weight, functionality, thermal, and mechanical properties.
Mentor: John La Scala john.j.lascala.civ@mail.mil (410) 306-0687
Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver,

Materials Manufacturing & Processing Science

Cryogenic Manufacturing and Processing of Nano-Materials Research (APG)
Investigate processing windows suitable for manufacturing to enable production of nano-particles via liquid nitrogen attrition.
Mentor: Kyu Cho kyu.c.cho2.civ@mail.mil (410) 306-0820
Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Materials State Awareness for Aviation Sustainment

Identification of Damage Precursor for Composite Materials (APG)

Explore and establish full understanding of science and technology to detect and capture material damage precursors prior to the onset of any material damages/flaws in composite materials systems.

Mentor: Asha Hall asha.j.hall.civ@mail.mil (410) 278-8036

Eligibility Restrictions: None

Multi-Scale Reactive Modeling for Energetics

Theoretical modeling and simulations of energetic materials in order to understand the structure-property and structure-phenomenological responses of energetics. The program focuses on building models from quantum mechanical to micro- to meso- to continuum scale with emphasis on building the models that bridge the length scales (APG).

Mentor: Betsy Rice betsy.rice.civ@mail.mil (410) 306-1904

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Structural Materials for Improved Vehicle Mobility and Stealth

Lightweight Structural Energy Storage Materials for Vehicles or Energy Harvesting Materials for Combustion Engine Sound Abatement (APG)

Investigate the assembly of flexible/moldable Si-Li energy storage designs into the structure of small unmanned vehicles. Investigate phenomenological modeling of magnetostrictive shunt damper configuration to maximize the shunt damper performance for reducing the sound emission of combustion engines.

Mentor: Mark Bundy mark.l.bundy2.civ@mail.mil (410) 278-4318
Jin Yoo jin.h.yoo6.civ@mail.mil (410) 278-7758

Eligibility Restrictions: None

Ultrafast Spectroscopy of Electronic, Optoelectronic, and Structural Materials

Carrier Localization and Recombination Dynamics in Semiconductor Alloys (ALC)

Investigate the impact of alloy and interface fluctuations in semiconductor alloys on carrier transport and recombination using femtosecond pump-probe, electroabsorption, and luminescence.

Mentor: Michael Wraback michael.wraback.civ@mail.mil (301) 394-1459

Eligibility Restrictions: None

Radiation and Doping Effects on Minority Carrier Lifetimes in Wide Bandgap Semiconductors (ALC)

Investigate the impact of radiation dosage and doping on minority carrier lifetime using time-resolved pump-probe and luminescence.

Mentor: Michael Wraback michael.wraback.civ@mail.mil (301) 394-1459

Eligibility Restrictions: None

Measurement of Thermal and Elastic Properties and Phonon Transport in Textured Ceramics and Wide Bandgap Materials (ALC)

Investigate acoustic phonon propagation in transparent ceramics and other wide bandgap materials as a function of texturing, as well as phonon transport at interfaces of these materials with metals and wide bandgap semiconductors.

Mentor: Michael Wraback michael.wraback.civ@mail.mil (301) 394-1459

Eligibility Restrictions: None

Strong Coupling in Nitride Semiconductor Quantum Dots (ALC)

Investigate the coherent transient properties of nitride semiconductor quantum dots in the strong coupling regime.

Mentor: Gregory Garrett gregory.a.garrett.civ@mail.mil (301) 394-1966

Eligibility Restrictions: None

High Field Carrier Dynamics and Transport in Deep UV Photodetectors (ALC)

Investigate carrier dynamics and transport above the direct bandgap in SiC and Si deep UV photodetectors.

Mentor: Michael Wraback michael.wraback.civ@mail.mil (301) 394-1459

Eligibility Restrictions: None

Hot Carrier Assisted Transport Across Liquid/Semiconductor Junctions (ALC)

Investigate the creation of semiconductor heterostructures that enable electron velocity and energy overshoot at a liquid/semiconductor junction and their impact on transport across the junction.

Mentor: Michael Wraback michael.wraback.civ@mail.mil (301) 394-1459

Eligibility Restrictions: None

Nonlinear Optical Properties of III-Nitride Polar and Nonpolar Heterostructures (ALC)

Employ ultrafast spectroscopy to investigate the optical switching dynamics in III-Nitride polar and nonpolar heterostructures for optical modulators.

Mentor: Michael Wraback michael.wraback.civ@mail.mil (301) 394-1459

Eligibility Restrictions: None

Sciences for Maneuver

Autonomy and Collaboration

Autonomous Systems Control (ALC)

Connect system control algorithms with dynamically constructed environment models to enhance robotic control methods. Investigate the use of hierarchies of robots for multi-agent tracking applications.

Mentor: Ethan Stump ethan.a.stump2.civ@mail.mil (301) 394-1222

Eligibility Restrictions: None

Information Sciences

Cloudlet-Based Processing

Verification and Validation of Cloudlet Provisioning Using EMANE (APG)

The Extendable Mobile Ad-hoc Network Emulator (EMANE) is a useful system to verify and validate network-based protocols. This project will investigate how to extend the system for models under development at ARL and also test current models being proposed for non-ad-hoc networks for scalability and performance.

Mentor: David Doria david.l.doria.civ@mail.mil (410) 278-2310

Eligibility Restrictions: None

Domain-Specific Languages

Investigation of Terra-Lua Approach for DSLs (APG)

ARL and Stanford University are working on the creation of DSLs targeting, in this case, finite element codes. This project will perform analysis of the Terra-Lua approach as it maps to a large-scale hybrid computing system using standard cores and GPU-based technologies.

Mentor: Dale Shires dale.r.shires.civ@mail.mil (410) 278-5006

Eligibility Restrictions: None

Information Architectures

Information to the Edge (ALC)

Develop adaptive methods for data dissemination and extraction in hybrid tactical networks. Explore machine learning and dynamic workflow techniques to dynamically allocate and configure sensing and processing assets to enhance small unit decision making.

Mentor: Larry Tokarcik larry.k.tokarcik.civ@mail.mil (301) 394-5614

Eligibility Restrictions: None

Natural Language Processing

Bot-Language (ALC)

Using formal logic specifications built from natural language mission descriptions, candidate will generate reactive controllers that govern low-level robot behaviors. Explore the application of these specifications to enhance Soldier-machine interfaces.

Mentor: Melissa Holland virginia.m.holland6.civ@mail.mil (301) 394-3001

Eligibility Restrictions: None

NLP for Cultural Understanding (ALC)

Automate the processing, analysis, and interpretation of text, including very low-resource foreign languages and social media, to support social network construction and relationship discovery from text toward new dimensions of socio-cultural insight.

Mentor: Melissa Holland virginia.m.holland6.civ@mail.mil (301) 394-3001

Eligibility Restrictions: None

Network & Information Sciences

Quality of Information (ALC)

Develop a foundational framework, including ties with semantic information theory; develop models for propagation of information in composite dynamic networks; experimental validation.

Mentor: Ananthram Swami ananthram.swami.civ@mail.mil (301) 394-2486

Greg Cirincione gregory.h.cirincione.civ@mail.mil (301) 394-4809

Eligibility Restrictions: None

Group Structures in Composite Networks (ALC)

Empirical study of group structures in multiple collaboration and other social networks; development of models of evolution.

Mentor: Ananthram Swami ananthram.swami.civ@mail.mil (301) 394-2486

Terrence Moore terrence.j.moore.civ@mail.mil (301) 394-1236

Eligibility Restrictions: None

Quantum Information Science

Quantum Physics (ALC)

Research topics include experimental and theoretical research in quantum entanglement, quantum imaging, quantum multi-photon interference, quantum information processing, and quantum communications.

Mentor: Ron Meyers ronald.e.meyers6.civ@mail.mil (301) 394-2111

Eligibility Restrictions: Ph.D. in physics

Sciences for Lethality and Protection

Dynamic Failure of Materials

Modeling of Dynamic Fracture (APG)

Discover the underlying mechanisms associated with material fracture and failure that occur at very high loading rates, create engineering-level models of the underlying mechanisms, and structure the models in a manner consistent for implementation into advanced computational mechanics codes.

Mentor: Todd Bjerke todd.w.bjerke2.civ@mail.mil (410) 278-5819

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

High-G Environment

High-G Simulation (ALC)

Develop detailed model of high-g simulation that can be used to tailor environment of test article.

Mentor: Morris Berman morris.berman@us.army.mil (301) 394-4188

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Flight Dynamics/Guidance, Navigation, and Control

Flight Dynamics and Guidance, Navigation, and Control (APG)

Flight dynamics and guidance, navigation, and control of guided precision munitions with emphasis on development of new algorithms of novel guided munitions.

Mentor: Frank Fresconi frank.e.fresconi.civ@mail.mil (410) 306-0794

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Humans in Extreme Environments

Understanding the Mechanisms of Traumatic Brain Injury (APG)

Develop computational and experimental methods to characterize the human response to ballistic loading.

Mentor: Christopher Hoppel christopher.p.hoppel.civ@mail.mil (410) 278-8878

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Modeling Development and Validation Via Novel Experimental Diagnostics

Conduct research in electrodynamics or plasma physics with an emphasis on conductors moving in EM fields, gasses under extreme conditions, and/or conceive of and develop unique experimental diagnostics for physics-based model or hydrocode validation (APG).

Mentor: Casey Uhlig willard.c.uhlig.civ@mail.mil (410) 278-3997

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Penetration Mechanics

Penetration Behavior of Brittle and Ductile Materials (APG)

Experimental and modeling and simulation for high-velocity impact.

Mentor: Brian Schuster brian.e.schuster.civ@mail.mil (410) 278-6733

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Human Sciences

Advanced Simulation

Soldier-Centered Army Learning Environment (SCALE) (Orlando, FL)

The purpose is to research and prototype a technology-enabled, data-driven learning environment for integrated training across multiple platforms (personal computers, mobile devices, games, virtual worlds, social media, and classroom teaching methods). Research is conducted to determine how and when Soldiers learn best in collaborative environments and assess performances; capture and share individual expertise and lessons learned; and develop user-friendly authoring tools that support rapid development of content across several platforms.

Mentor: Chris Gaughan chris.gaughan@us.army.mil (407) 384-3323

Eligibility Restrictions: None

Dismounted Soldiers

Blending Live and Virtual Training Simulations (Orlando, FL)

Conduct research into technologies to blend live and virtual training simulations. Research technologies include virtual locomotion, avatar group behaviors, visual stimulates, positioning sensors, artificial intelligence, and see-through helmet-mounted displays.

Mentor:	Pat Garrity	pat.garrity@us.army.mil	(407) 384-3663
	Frank Dean	frank.dean@us.army.mil	(407) 384-3877

Eligibility Restrictions: None

Live Training Technologies

Training and Operational Simulations in the Army Live Training Domain (Orlando, FL)

Conduct research into training and operational simulations in the Army Live Training Domain. Technologies being researched include hybrid position and navigation sensors, next-generation lasers, embedded simulations in operational systems, enemy predictive technologies, micro-cloud architectures, and tracking technologies inside structures.

Mentor:	Frank Tucker	frank.tucker@us.army.mil	(407) 384-5448
	Bonnie Eifert	latika.effert@us.army.mil	(407) 384-5338

Eligibility Restrictions: None

Soldier Performance - Interaction of Physical and Cognitive Performance

Interaction of Physical and Cognitive Performance for the Dismounted Soldier (APG)

The project investigates the effects of physical and cognitive stress on Soldier performance and determines new ways of measuring these stressors in operational environments.

Mentor:	Michael LaFiandra	michael.lafiandra@us.army.mil	(410) 278-5973

Eligibility Restrictions: None

POSTDOCTORAL OPPORTUNITIES

Extramural Basic Research

Network Science

Network Science (ALC)

Develop theories and experimentally validated models for the structure, dynamics, and interactions of co-evolving networks; develop metrics for composite dynamic networks; determine how processes and parameters in one network affect and are affected by those in the co-evolving networks; predict and control individual and composite behavior of these complex interacting networks.

Mentor: Hasan Cam hasan.cam.civ@mail.mil (301) 394-2871

Eligibility Restrictions: U.S. citizens; Applicants should have a PhD in Electrical Engineering, Computer Science, Mathematics, or related field.

Computational Sciences

Computational Fluid Dynamics

Research in computational fluid dynamics, turbulence modeling, and grid generation is performed with emphasis on nonlinear and unsteady aerodynamics (APG).

Mentor: Jubaraj Sahu jubaraj.sahu.civ@mail.mil (410) 306-0798

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Heterogeneous Computing

Autotuning for Enhanced Software Performance (APG)

This effort is devoted to developing technologies to allow HPC software to optimize within a runtime environment. Kernels will be automatically generated to test parameter spaces within complex hybrid core technologies where instruction scheduling and other compiler phase ordering passes lead to intractability for efficiency assessment a priori. This effort is focused on combining algorithmic development and software engineering to maximize efficiency of software across a myriad of cores with limited developer effort.

Mentor: Mr. Dale Shires dale.r.shires.civ@mail.mil (410) 278-5006

Eligibility Restrictions: None

Energy Efficient Software Improvements for Constrained Devices (APG)

Investigate and develop more efficient approaches to software design and implementation on disparate core technologies to reduce energy consumption. Areas of interest include code refactoring, variations in low-level instruction scheduling, and dynamic gating utility to name but a few. Develop parameterized models for software execution using various binary processing configurations to discover relationships between power utilization and software efficiency.

Mentor: Mr. Song Park song.j.park.civ@mail.mil (410) 278-5444

Eligibility Restrictions: None

Neurosynaptic Computing

Algorithm Development and Assessment for Neurosynaptic Architectures (APG)

Develop computational science algorithms using neurosynaptic computing models for Army-relevant problem spaces such as reasoning and cognition. Investigate alternative and/or additional biologically based models for binary execution in order to more accurately mimic human brain processing and provide accurate and efficient processing solutions.

Mentor: Dr. Manuel Vindiola manuel.m.vindiola.civ@mail.mil (410) 278-9151

Eligibility Restrictions: None

Quantum Computing

Investigation of the Dwave Adiabatic Quantum Computer (APG)

Investigate the use of adiabatic quantum computing for optimization problems found in scheduling in cloudlet-based networks of computers.

Mentor: Dr. Radhakrishnan Balu radhakrishnan.balu.ctr@mail.mil (410) 278-6174

Eligibility Restrictions: None

Quantum Circuit Algorithms for Quantum Routers (APG)

Investigate the algorithmic design and constraints when dealing with quantum entanglement and networking over long distances, hence the need for quantum routers.

Mentor: Dr. Radhakrishnan Balu radhakrishnan.balu.ctr@mail.mil (410) 278-6174

Eligibility Restrictions: None

Materials Research

Aperiodic to Nanostructured Materials

Design and Thermal Stabilization of Metastable Materials (APG)

Experimental investigations and computational approaches to thermodynamic and kinetic stabilization of novel materials.

Mentor: Kristopher Darling kristopher.darling.civ@mail.mil (410) 306-0862

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Atmospheric Plasma Modification of Materials

Research and development of novel, scalable methods to modify and deposit thin coatings on materials surfaces using plasma-assisted wet chemistry and spray deposition techniques. Material analysis techniques including SEM, XPS, contact angle goniometry, FTIR, XRD, and tensile strength testing will be employed. The work involves the development and characterization of novel polymers/fibers, polymer blends/hybrids, nanomaterials, new process methods for applying or modifying polymers to increase service life, environmental durability, and providing chemical-biological protection/detection and/or ballistic protection. The incumbent should have technical publications showing the ability to develop new coating formulations and have demonstrated success in working within a team of scientists. Position involves developing experimental and theoretical work to explore the potential of applying plasma technology to the growth of thin, conformal, multifunctional coatings for Army applications and to produce technical reporting of findings (APG).

Mentor: Andres Bujanda andres.a.bujanda.civ@mail.mil (410) 306-0680

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Chemical Agent Resistant Coatings (CARC) Development

Coatings Fundamental Research (APG)

Researcher will provide fundamental research and analysis to support the research and development of coatings, understanding of the chemical resistance of coatings, reducing the environmental footprint, and reducing materials degradation/corrosion. Formulate epoxy, polyurethane, and other thermosetting materials for use as coatings.

Characterize thermosetting resins for chemical resistance via PALS, solvent absorption, and other studies.

Characterize thermal and mechanical analysis of organic-based films and coatings.Formulate and prepare model coatings and coatings for Army applications using thermosetting resin binders. Provide expert analysis of product performance and characteristics through various instrumental methods. Develop structure/property relationships for

coatings materials via measurement of material properties and analysis of chemical, nano, and micro-structure using tools such as dynamic mechanical analysis (DMA/DMTA), differential scanning calorimetry (DSC), positron annihilation spectroscopy (PALS), infrared spectroscopy (IR), microscopy, scanning electron microscopy (SEM), and solvent absorption. Conduct performance testing of coatings according to military specifications and related ASTM protocols. Develop improvements for quality of applications, products, and/or procedures. Formulate and evaluate camouflage coatings and related epoxy coatings used to extend life cycles of coating performance. Formulate improved coatings for resistance to chemical infiltration/absorption, resistance to degradation, mitigation of corrosion, and reduction in environmental footprint. Evaluate materials for corrosion resistance using accelerated weathering techniques and coatings evaluation techniques, including electrical impedance spectroscopy (EIS).

Mentor: John Escarsega john.a.escarsega.civ@mail.mil (410) 306-0690
John La Scala john.j.lascala.civ@mail.mil (410) 306-0687

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Corrosion

Corrosion Micro/Nano Research (APG)

Perform fundamental corrosion research at the micro/nano scale. Use and develop new techniques to analyze and understand corrosion at micro/nano scale that could be used to potentially mitigate corrosion.

Mentor: Joseph Labukas joseph.p.labukas.civ@mail.mil (410) 306-4939

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Electrochemical Breakdown or Synthesis of Organic Molecules (APG)

Corrosion of organic molecules to initiate desired breakdown or synthesis. This especially includes the desired breakdown of coatings to monomers to be able to more effectively recycle components for sustainable use of coatings.

Mentor: Joseph Labukas joseph.p.labukas.civ@mail.mil (410) 306-4939

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Deformation Processing of Lightweight Materials

Severe Plastic Deformation Processing of Novel Materials (APG)

Equal channel angular extrusion, friction stir, and surface mechanical attrition treatment processing methodologies to impart metals and alloy with improved properties.

Mentor: Kevin Doherty kevin.doherty18.civ@mail.mil (410) 306-0871

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Detonation Science

High-Speed Diagnostics - Experimental Techniques to Characterize the Reaction of Energetic Materials When Subjected to Shock (APG)

Mentor: Matt Biss matthew.m.biss.civ@mail.mil (410) 278-3708

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Disruptive Energetics

High-Pressure Synthesis (APG)

Discovery and inventions of novel energetic materials. Methodologies for discovery include mechanochemical synthesis and high-pressure chemistry and physics.

Mentor: Jennifer Ciezak-Jenkins jennifer.a.ciezak-jenkins.civ@mail.mil (410) 278-6169

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Synthesis of Energetic Materials (APG)

Research into higher-energy CHNO molecules that offer increased output and are less sensitive than current material.

Mentor: Joe Banning joseph.e.banning2.civ@mail.mil (410) 278-9656

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Growth of III-V-Nitride Materials and Devices

Novel Transparent Hole Injection Schemes for UV Emitters (ALC)

Investigate the incorporation of novel impurity and polarization enhanced doping schemes to simultaneously improve hole injection and UV extraction efficiency.

Mentor: Anand Sampath anand.v.sampath.civ@mail.mil (301) 394-0104

Eligibility Restrictions: None

High-Temperature MBE Growth Dynamics (ALC)

Investigate the dynamics of group III adlayer formation, surface mobility, and adsorption, as well as impurity incorporation in III-N material growth at high growth temperatures comparable to those employed for commercial MOCVD processes.

Mentor: Anand Sampath anand.v.sampath.civ@mail.mil (301) 394-0104

Eligibility Restrictions: None

Rare Earth Doped III-Nitride Heterostructure Materials and Devices (ALC)

Investigate the incorporation of rare earth ions into III-Nitride heterostructures and diodes and the impact of large tunable electric fields on the optical properties of the rare earth ions.

Mentor: Anand Sampath anand.v.sampath.civ@mail.mil (301) 394-0104

Eligibility Restrictions: None

High-Performing Bio-Based Polymers

The primary focus of the researcher would be to chemically prepare monomers, and thermoplastic and thermosetting polymers from biological sources. The researcher would use chemical synthetic techniques to prepare the monomers. We are looking for candidates with experience in the synthesis of small molecules, scale-up of reactions to moderate sizes (~100 g), and purification of products. The researcher would then use analytical tools and instrumentation, such as titration methods, NMR, FTIR, and GPC, to characterize the resulting chemicals and monomers. The researcher would polymerize the monomers using common and novel techniques and characterize various properties of the polymers, including molecular weight, functionality, and thermal and mechanical properties (APG).

Mentor: John La Scala john.j.lascala.civ@mail.mil (410) 306-0687

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Materials Manufacturing & Processing Science

Cryogenic Manufacturing and Processing of Nano-Materials (APG)

Investigate processing windows suitable for manufacturing to enable production of nano-particles via liquid nitrogen attrition.

Mentor: Kyu Cho kyu.c.cho2.civ@mail.mil (410) 306-0820

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Materials State Awareness for Aviation Sustainment

Identification of Damage Precursor for Composite Materials (APG)

Develop embedding sensing capability for military aircraft composite structures to identify, characterize, and categorize specific materials damage precursors that can be used to predict failure of aircraft structures prior to the onset of actual damages.

Mentor: Asha Hall asha.j.hall.civ@mail.mil (410) 278-8036

Eligibility Restrictions: None

Multi-Scale Reactive Modeling for Energetics

Theoretical Modeling and Simulations of Energetic Materials in order to understand the structure-property and structure-phenomenological responses of Energetics. The program focuses on building models from quantum mechanical to micro- to meso- to continuum scale with emphasis on building the models that bridge the length scales (APG).

Mentor: Betsy Rice betsy.rice.civ@mail.mil (410) 306-1904

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Structural Materials for Improved Vehicle Mobility and Stealth

Lightweight Structural Energy Storage Materials for Vehicles or Energy Harvesting Materials for Combustion Engine Sound Abatement (APG)

Investigate assembly of flexible/moldable Si-Li energy storage for small unmanned vehicles. Investigate technologies/materials for reducing the structural vibration and acoustic emission from combustion engine platforms.

Mentor: Mark Bundy mark.l.bundy2.civ@mail.mil (410) 278-4318

Jin Yoo jin.h.yoo6.civ@mail.mil (410) 278-7758

Eligibility Restrictions: None

Ultrafast Spectroscopy of Electronic, Optoelectronic, and Structural Materials

Carrier Localization and Recombination Dynamics in Semiconductor Alloys (ALC)

Investigate the impact of alloy and interface fluctuations in semiconductor alloys on carrier transport and recombination using femtosecond pump-probe, electroabsorption, and luminescence.

Mentor: Michael Wraback michael.wraback.civ@mail.mil (301) 394-1459

Eligibility Restrictions: None

Radiation and Doping Effects on Minority Carrier Lifetimes in Wide Bandgap Semiconductors (ALC)

Investigate the impact of radiation dosage and doping on minority carrier lifetime using time-resolved pump-probe and luminescence.

Mentor: Michael Wraback michael.wraback.civ@mail.mil (301) 394-1459

Eligibility Restrictions: None

Measurement of Thermal and Elastic Properties and Phonon Transport in Textured Ceramics and Wide Bandgap Materials (ALC)

Investigate acoustic phonon propagation in transparent ceramics and other wide bandgap materials as a function of texturing, as well as phonon transport at interfaces of these materials with metals and wide bandgap semiconductors.

Mentor: Michael Wraback michael.wraback.civ@mail.mil (301) 394-1459

Eligibility Restrictions: None

Strong Coupling in Nitride Semiconductor Quantum Dots (ALC)

Investigate the coherent transient properties of nitride semiconductor quantum dots in the strong coupling regime.

Mentor: Gregory Garrett gregory.a.garrett.civ@mail.mil (301) 394-1966

Eligibility Restrictions: None

High Field Carrier Dynamics and Transport in Deep UV Photodetectors (ALC)

Investigate carrier dynamics and transport above the direct bandgap in SiC and Si deep UV photodetectors.

Mentor: Michael Wraback michael.wraback.civ@mail.mil (301) 394-1459

Eligibility Restrictions: None

Hot Carrier Assisted Transport Across Liquid/Semiconductor Junctions (ALC)

Investigate the creation of semiconductor heterostructures that enable electron velocity and energy overshoot at a liquid/semiconductor junction and their impact on transport across the junction.

Mentor: Michael Wraback michael.wraback.civ@mail.mil (301) 394-1459

Eligibility Restrictions: None

Nonlinear Optical Properties of III-Nitride Polar and Nonpolar Heterostructures (ALC)

Employ ultrafast spectroscopy to investigate the optical switching dynamics in III-Nitride polar and nonpolar heterostructures for optical modulators.

Mentor: Michael Wraback michael.wraback.civ@mail.mil (301) 394-1459

Eligibility Restrictions: None

Sciences for Maneuver

Autonomy and Collaboration

Autonomous Systems Control (ALC)

Connect system control algorithms with dynamically constructed environment models to enhance robotic control methods. Investigate the use of hierarchies of robots for multi-agent tracking applications.

Mentor: Dr. Ethan Stump ethan.a.stump2.civ@mail.mil (301) 394-1222

Eligibility Restrictions: None

Ground Vehicle Structural Mechanics and Dynamics Technology

Phenomenological Model for Magnetostrictive Material Behavior (APG)

Establish a numerical expression for the strain response as functions of applied magnetization and external stress, and predict the response.

Mentor: Jin Yoo jin.h.yoo6.civ@mail.mil (410) 278-7758

Eligibility Restrictions: None

Information Sciences

Bio-Aerosols Isolation and Characterization

Bio-Aerosols Isolation and Characterization (ALC)

Methodologies are developed to precisely identify/characterize hazardous bio-aerosols.

Mentor: Yongle Pan yongle.pan.civ@mail.mil (301) 394-1381
Steven Hill steven.c.hill32.civ@mail.mil (301) 394-1813

Eligibility Restrictions: None

Cloudlet-Based Processing

Scheduling and Provisioning within Army Cloudlets (APG)

This research involves investigating new model development to couple mobile ad hoc networking with computing assets deployed in the field. Approximation methods will be investigated to facilitate provisioning and scheduling in real time.

Mentor: David Bruno david.l.bruno4.civ@mail.mil (410) 278-8929
Eligibility Restrictions: None

Information Architectures

Information to the Edge (ALC)

Develop adaptive methods for data dissemination and extraction in hybrid tactical networks. Explore machine learning and dynamic workflow techniques to dynamically allocate and configure sensing and processing assets to enhance small unit decision making.

Mentor: Larry Tokarcik larry.k.tokarcik.civ@mail.mil (301) 394-5614
Eligibility Restrictions: None

Natural Language Processing

Bot-Language (ALC)

Using formal logic specifications built from natural language mission descriptions, the candidate will generate reactive controllers that govern low-level robot behaviors. Explore the application of these specifications to enhance Soldier-machine interfaces.

Mentor: Melissa Holland virginia.m.holland6.civ@mail.mil (301) 394-3001
Eligibility Restrictions: None

NLP for Cultural Understanding (ALC)

Automate the processing, analysis, and interpretation of text, including very low-resource foreign languages and social media, to support social network construction and relationship discovery from text toward new dimensions of socio-cultural insight.

Mentor: Dr. Melissa Holland virginia.m.holland6.civ@mail.mil (301) 394-3001
Eligibility Restrictions: None

Network & Information Sciences

Network Tomography (ALC)

Development of theories, fundamental performance bounds, algorithms, and performance guarantees for inference of network state and topology from partial and inaccurate information in dynamic and stochastic settings; detection of changes.

Mentor: Ananthram Swami ananthram.swami.civ@mail.mil (301) 394-2486
Eligibility Restrictions: None

Co-Evolution & Dynamics of Networks (ALC)

Develop framework for modeling co-evolution and dynamics in inter-genre networks, including large and adversarial network. Characterize co-evolution of structural vs. functional/behavioral traits. Develop tools for discovery, inference, and prediction in inter-genre networks.

Mentor:	Ananthram Swami	ananthram.swami.civ@mail.mil	(301) 394-2486
	Terry Moore	terrence.j.moore.civ@mail.mil	(301) 394-1236

Eligibility Restrictions: None

Models of Information Propagation in Composite Networks (ALC)

Model social influence using probabilistic graph models; exploit tensor decomposition to transform graphical models into structurally simpler graphical models; develop inference and prediction techniques (for both static and dynamic networks).

Mentor:	Ananthram Swami	ananthram.swami.civ@mail.mil	(301) 394-2486

Eligibility Restrictions: None

Quality of Information (ALC)

Development of foundational framework, including ties with semantic information theory; development of an appropriate theory of information. Extensions of subjective logic for fusion for QoI.

Mentor:	Ananthram Swami	ananthram.swami.civ@mail.mil	(301) 394-2486
	Greg Cirincione	gregory.h.cirincione.civ@mail.mil	(301) 394-4809
	Lance Kaplan	lance.m.kaplan.civ@mail.mil	(301) 394-0807

Eligibility Restrictions: None

Quantum Information Science

Quantum Physics (ALC)

ARL is seeking postdoctoral researchers in the area of quantum physics. Research topics include experimental and theoretical research in quantum entanglement, quantum imaging, quantum multi-photon interference, quantum information processing, and quantum communications.

Mentor:	Ron Meyers	ronald.e.meyers6.civ@mail.mil	(301) 394-2111

Eligibility Restrictions: Applicants must have a Ph.D. in physics

Sciences for Lethality and Protection

Dynamic Failure of Materials

Modeling of Dynamic Fracture (APG)

Discover the underlying mechanisms associated with material fracture and failure that occur at very high loading rates, create engineering-level models of the underlying mechanisms, and structure the models in a manner consistent for implementation into advanced computational mechanics codes.

Mentor: Todd Bjerke todd.w.bjerke2.civ@mail.mil (410) 278-5819

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Flight Dynamics/Guidance, Navigation, and Control

Flight dynamics/guidance, navigation, and control of guided precision munitions with emphasis on development of new algorithms of novel guided munitions (APG).

Mentor: Frank Fresconi frank.e.fresconi.civ@mail.mil (410) 306-0794

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

High-G Environment

Interior Ballistic Structural Models (APG)

Use high-fidelity FE modeling methods to simulate structural response to the interior ballistic environment.

Mentor: William Drysdale william.h.drysdale.civ@mail.mil (410) 306-0945

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

High-Rate Experimental Mechanics of Materials at Different Length Scales

Deformation and Failure Mechanisms for Army-Relevant Materials (APG)

Understanding the relationship between mechanical, electrical, and chemical response of materials to mechanical loading by identifying associated micro-mechanisms through quantitative in-situ visualization.

Mentor: Tusit Weerasooriya tusit.weerasooriya@us.army.mil (410) 306-0969

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Humans in Extreme Environments

Understanding the Mechanisms of Traumatic Brain Injury (APG)

Develop computational and experimental methods to characterize the human response to ballistic loading.

Mentor: Christopher Hoppel christopher.p.hoppel.civ@mail.mil (410) 278-8878

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Penetration Mechanics

Penetration Behavior of Brittle and Ductile Materials (APG)

Experimental, and modeling and simulation for high-velocity impact.

Mentor: Brian Schuster brian.e.schuster.civ@mail.mil (410) 278-6733

Eligibility Restrictions: 1) U.S. citizen, 2) Ability to obtain security clearance (preferred), 3) Ability to obtain positive NAC waiver.

Science of Cyber Security

Networked Trust and Its Impact on Security (ALC)

Develop models of networked trust and its impact on cyber security; experimental validation with a mixture of agent models and HiTL testing.

Mentor: Ananthram Swami ananthram.swami.civ@mail.mil (301) 394-2486
Jin-Hee Cho jin-hee.cho.civ@mail.mil (301) 394-0492
Kevin Chan kevin.s.chan.civ@mail.mil (301) 394-5640

Eligibility Restrictions: None

Human Sciences

Adaptive Tutoring

Adaptive Computer-Based Tutoring Research (Orlando, FL)

The goal of this research is to develop methods to assess the cognitive and affective states of trainees in near–real time and then use this state data to adapt computer-based instruction to enhance/accelerate learning outcomes (e.g., knowledge and skill acquisition, retention). The research program has three thrusts: trainee modeling, authoring and expert modeling, and instructional strategy selection. Trainee modeling includes assessment techniques for determining cognitive and affective states through behavioral and physiological sensing techniques and machine learning algorithms. Authoring and expert modeling research explores the automated development of instructional content and expert models used as standards to define the trainee's performance level. Finally, instructional strategy selection research develops and assesses machine learning techniques to automatically guide the tutor's performance (e.g., interaction with the trainee, selection of instructional content and feedback, pace, and challenge level of instruction).

Mentor: Robert Sottilare robert.sottilare@us.army.mil (407) 616-1860

Eligibility Restrictions: None

Bone Conduction (BC) Perception and Communication Systems

Bone Conduction Perception: Physiology (APG)

Humans can hear sounds through air conduction (the pathway that starts with the external ear) and bone conduction (through vibrations of the skull). While air conduction is the dominant mode of hearing, bone conduction can be very useful in various military and security operations. Radio and audio signals can be converted into skull vibration by vibrators located on the head, and skull vibrations during speech production can be picked up by bone microphones (accelerometers) and transmitted over audio and radio channels. There is some evidence that air- and bone-conducted signals may be processed differently at the cochlear and retrocochlear levels, but it is not clear. Similarly, it is not clear if there are any differences in brain processing of sounds conducted by bone stimulation of audible and ultrasound stimuli. This research opportunity may involve analysis of bone conduction pathways in the head, collection of brain recordings during auditory task, implementation of advanced brain signal processing methods, and optimization of air- and bone-conducted signals for speech recognition and comprehension under various operational conditions.

Mentor: Piotr Franaszczuk piotr.j.franaszczuk.civ@mail.mil (410) 278-8003

Eligibility Restrictions: None

Brain Structure Function Coupling

Understanding Brain Structure-Function Relationships in Healthy Individuals (APG)

ARL's Neuroscience program seeks to enable revolutionary advances in Soldier-system performance by integrating modern neuroscience with computer science and engineering to both enhance our understanding of Soldier function in complex operational settings and develop novel and effective means to enhance systems design. ARL's neuroscience efforts focus on the scientific study of the brain and its interaction with technology. We are looking for post-doctoral colleagues to advance efforts in brain structure-function couplings. The brain structure-function couplings effort incorporates several neuroimaging methods to image structure (MPRAGE, diffusion imaging) and function (mostly EEG with some fMRI) to derive structural and functional networks for an individual. Ongoing research examines the sensitivity and reliability of reconstruction methods to derive structural tractography from diffusion-weighted imaging as well as the ability of functional connectivity measures to derive task-relevant, functional networks. The successful applicant will implement and evaluate metrics (e.g., network-level descriptions) that quantify individual differences in structural and/or functional connectivity.

Mentor: Jean Vettel jean.m.vettel.civ@mail.mil (410) 278-7431

Eligibility Restrictions: None

Human-Robot Interaction

Enhancing Performance of Human-Robot Interaction (HRI) Teams (APG)

Military operations depend more and more on an array of unmanned technology, such as ground vehicles, air vehicles, sensors, and microsystems. The inclusion of unmanned systems, information networks, and advanced sensor suites are intended to enhance operational performance and Soldier safety. However, the implications of these technologies for human use are not always fully understood nor are they always considered during design. The Soldier's role for interaction with unmanned systems is broad, ranging from robot operator to information manager to information consumer. The goal of our HRI program is to maximize the effectiveness of integrating unmanned technology into the Soldier team through the development of state-of-the-art Soldier-system interactions. We seek to identify tools, techniques, and measures that can be used to improve and assess performance with unmanned systems across multiple environments. Specific issues to be addressed include unmanned and manned vehicle autonomy, intuitive communications and interfaces, supervisory control, teaming, situation awareness, and strategies for workload management. ARL's Human Research and Engineering Directorate is currently conducting HRI research at APG, MD. Research environments include laboratory, simulation, and field environments.

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Eligibility Restrictions: None

Human-Robot Interaction and Advanced Displays for Human-Vehicle Interaction (Orlando, FL)

ARL is conducting research on human-robot interaction (HRI) and advanced displays for human-vehicle interaction (HVI). HRI and HVI are both complex work environments where the human operator engages in multiple simultaneous goal-oriented tasks (e.g., communication, navigation, reconnaissance, security, and control of other systems while on the move). Other HRI research involves experiments on live and simulated robot teleoperation; specific research areas include display technologies (e.g., multi-modal displays and stereoscopic displays) and automation techniques (e.g., adaptive automation) to enhance the robotics operator's performance in multi-tasking environments. Our research on advanced displays for HVI focuses on augmented/overlaid information on vehicle vision block for indirect-vision driving and embedded training. State-of-the-art simulators and equipment are used in both research areas.

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Eligibility Restrictions: None

Soldier Auditory Situation Awareness

Identification of Military-Relevant Sound Events in Complex Operational Environments (APG)

Auditory information is often the first alert to events occurring in an environment. Recognition of sound sources can inform the Soldier of relevant events occurring in his surroundings. However, the science of sound identification is still relatively unexplored and highly dependent on context. In order to develop Soldier training and military aids, we seek to characterize auditory scenes by identifying auditory events important in the spectrum of military operations. This requires that we understand the features that allow the listener to recognize and identify aspects of relevant sound-source events. Models of these source and sound feature relationships have several applications. They can be used to predict Soldier performance in complex environments as well as develop training paradigms, either to train Soldiers in the identification of sounds themselves or to design realistic virtual training simulations. This work

may include studies in sound source identification, development of sensory training tools and paradigms, and perception modeling of auditory and multimodal perception.

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Eligibility Restrictions: None

Stealth Military Operations and Force Protection (APG)

The object of this research is to identify ways to reduce the auditory information available to enemy forces about individual Soldier and squad activities by minimizing and manipulating one's (individual or squad) auditory signature. This research involves various methods of manipulating the surrounding environment in order to hide the Soldier's presence, deceive the enemy by simulating the Soldier's presence at a different location, and project false information about the strength of the actual force. Data obtained could guide the creation of devices and procedures that mask, multiply, or misdirect the auditory information available to the enemy. This requires the extension of the current understanding of sound identification principles and their application within different contexts. In addition, this may include an understanding of the perceptual principles that induce change deafness. This understanding must include the multimodal cues that drive the real-world processing of one's operational environment.

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Eligibility Restrictions: None

Auditory Situation Awareness in Complex Acoustic Environments (APG)

ARL is investigating the effects of complex acoustical environments on Soldier performance. Acoustic signals are often the first evidence of activity or a presence, and they are the only type of information about the surrounding environment that is available to the Solider regardless of the time of day and from all directions. Detection of acoustic signals and recognition of acoustic signatures, and the directions from which they come, are critical because they may mean the difference between life and death. The primary research goal is to describe and predict the effects of auditory features present in urban military operations on Soldier auditory awareness and to quantify these effects on performance. Auditory situation awareness is defined as the ability to detect, recognize, and localize sound events. Urban acoustic environments include the effects of reverberation, direct and indirect sound pathways, background and impulse noise, movement, and mutual masking of multiple sound sources, including self-made Soldier sounds. Perception and high-level mental processing of these events are also dependent on the Soldier's mission, knowledge of the physical environment, and attentional workload. This research addresses issues not traditionally considered separately in auditory research because the complexities of the military auditory environment demand it. Data obtained from this research form the basis for determining the effects of Soldier equipment and spatial situation on auditory performance and feed various models of Soldier performance.

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Eligibility Restrictions: None

Effect of Signal Processing on Auditory Spatial Perception (APG)

Increasingly, Soldiers are being provided with radios and headsets for use with their radios. Because these headsets provide hearing protection from loud noises and some form of hearing restoration via externally mounted microphones, these tactical communications and protection systems (TCAPS) are viewed by many as a significant improvement. Soldiers, historically reluctant to wear hearing protection, may increase their compliance with hearing conservation guidelines if they are provided with communications capability. Further, the "ambient situation awareness" capability provided by the microphones is sometimes touted as "enhanced hearing" or as "combat hearing aids" because they allow the user to set the level and even provide some amplification. However, these devices also alter the cues used for auditory spatial perception. Most notably, the level of sounds passed through the headset from the ambient microphones is limited to prevent the user from being exposed to unsafe noise levels. This is achieved in various ways. The system can simply shut off and not transmit sounds above a certain intensity level. Or it can compress the range of levels transmitted, passing lower levels through unchanged but reducing the level as a function of intensity for higher levels. This compression changes the relative level cues that are the main source of distance perception cues. It is unknown the degree to which this occurs or the operational effect of such changes. The object of this research is to understand the degree to which sensitivity to distance cues is affected, the degree to which this is a function of experience, and the operational impact of such changes.

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Eligibility Restrictions: None

Soldier Performance - Interaction of Physical and Cognitive Performance

Biomechanics for a Dismounted Warrior (APG)

Our biomechanics program focuses on understanding the effects of equipment on the Solider and Soldier-system performance. Specifically, we examine Solider-equipment issues for dismounted Soldiers (i.e., Soldiers not riding in vehicles). Biomechanical analyses are used to minimize the negative effects of this equipment and to provide design guidance for maximizing the positive effects. Our current biomechanics laboratory is being replaced by a state-of-the-art 2700 square foot biomechanics lab with an integrated force plate treadmill, portable cardio-pulmonary and EMG systems, and motion capture system.

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Eligibility Restrictions: None

FREQUENTLY ASKED QUESTIONS

Q: Where would I be working?

ARL is headquartered in Adelphi, MD, and occupies major sites at Aberdeen Proving Ground, MD; Research Triangle Park, NC; White Sands Missile Range, NM; and Orlando, FL. Unique facilities at our primary sites provide scientists and engineers access to world-class research centers. Opportunities currently exist at several of our major sites:

- ADELPHI LABORATORY CENTER (ALC) is located approximately 10 miles north of the center of Washington, DC, and approximately 26 miles southwest of Baltimore, MD. The center is within one mile of both I-495, also known as the Capital Beltway, and I-95. ALC is located in Montgomery and Prince George's Counties, MD.
- ABERDEEN PROVING GROUND (APG) is the Army's oldest active proving ground established on October 20, 1917, six months after the United States entered World War I. It remains one of the Army's most active and diversified installations. Situated at the mouth of the Chesapeake Bay and bordered by the Susquehanna and Gunpowder Rivers, APG is surrounded by some of the best natural resources that Maryland has to offer. Located along the I-95 corridor, APG is approximately 74 miles to Philadelphia, 71 miles to Washington DC, and 32 miles to Baltimore.
- ORLANDO, FL, is the home of ARL's Simulation and Training Technology Center. It is located approximately 15 miles east of downtown Orlando, FL.
- WHITE SANDS MISSILE RANGE (WSMR) is located in the Tularosa Basin of south-central New Mexico. The headquarters area is 20 miles east of Las Cruces, NM, and 45 miles north of El Paso, TX. The range boundaries extend almost 100 miles north to south by 40 miles east to west. At almost 3,200 square miles, the range is the largest military installation in the country.

Q: Are there security requirements for working with ARL?

All personnel working at ARL must undergo a basic background check of his or her criminal and credit histories to ensure that they are "reliable, trustworthy, of good conduct and character, and loyal to the United States." The length and depth of the background investigation will depend on the position's requirements, as well as the type of security clearance if needed for a particular job or internship. If selected for a position that requires a security clearance, the individual will be required to complete an SF 312 Nondisclosure Agreement in accordance with Executive Order 13526 as part of their responsibility to protect sensitive information. In order to help speed the process along, candidates should begin to gather relevant information now. The forms for background checks (SF-85: Questionnaire for Non-Sensitive Positions) and (SF-86: Questionnaire for Non-Sensitive Positions) are on the Office of Personnel Management's website and can be found at http://www.opm.gov/forms/standard-forms/.

For U.S. Citizens: In addition to forms SF-85 and SF-86, a fingerprint card will need to be completed at the local Intel & Security Office.

For Non-U.S. Citizens: In addition to forms SF-85 and SF-86, the following is needed:

- Fingerprint card must be completed.

- Two forms of picture identification must be presented (one of which must be a valid Passport/VISA, or Resident Alien Card).

Q: I am a foreign graduate student. Can I work at ARL?

YES.

Non-U.S. citizen employees will be issued a Foreign National "V" Escort Required Badge as well as a Foreign National DoD Common Access Card (CAC). This badge authorizes access to designated ARL Buildings/Rooms from 0800 to 1700 hours, Monday through Friday only, except Federal holidays. Access during other times and to other ARL facilities requires prior approval of the ARL Foreign Disclosure Officer (FDO).

- The ARL badge will be prominently displayed on an exterior garment above the waist, with photo and/or markings visible from the front, at all times while inside restricted areas.
- The ARL badge will need to be renewed every 30 days by visiting the Visitor Control Center and completing the necessary paperwork. The Contact Officer/Alternate Contact Officer or designated escort(s) are required to sign for the badge.
- The ARL badge will not be worn outside of the ARL campus. Badges will not be used for identification purposes outside of the ARL installation and facilities, and will not be used for private purposes, such as cashing checks.
- The individual bearers shall be responsible for the care and safeguarding of badges issued to them. The loss of a security badge must be reported at once, in writing, to the Intelligence and Security Division, Access Control/Badging Office.
- Visitors to ARL are subject to the restrictions used by federal law, statutes, Army, IMCOM, ALC regulations, policies and procedures, and this memorandum.
- All other activities, meetings, or events at other locations within ARL, as well as access outside the core working hours, require an escort at all times. Prior approval must be granted by the Foreign Disclosure Officer.

FOREIGN NATIONAL ACCESS TO ARL FACILITIES:

Except for the Army Research Office (ARO) in Research Triangle Park, NC, and the Simulation and Training Technology Center (STTC) sites in Orlando, FL, ARL facilities are located on a "closed post." Note the following ARL installation entrance requirements (including all perimeter fence gates or the individual restricted areas within the installation):

- Entry onto ARL by any motor vehicle or other wheeled device subjects the operator and occupants to a search of their person and vehicle by law enforcement authorities assigned to ARL as authorized by law.
- No person will drive a privately owned vehicle on the installation without having on his/her person a valid state driver's license, vehicle registration, and proof of insurance. The owner of the vehicle is also responsible for ensuring that any other person operating his/her vehicle is properly licensed and carries a valid license on his/her person while operating the vehicle.
- Entry by individuals will be admitted upon display of appropriate Common Access Card (CAC) or Civilian Identification Card and Civilian driver's license. Employees/Guest Researchers without a DoD ID will be stopped; their vehicle will be inspected, and they will need to obtain a temporary vehicle pass for that day.

- Access for drivers will be at the main gate, where their vehicles may be inspected prior to entry. Parking is authorized in any of the available lots.

Q: Will I still be able to publish my research if I work with ARL, or will my work be classified?

Much of the work conducted at ARL is basic or applied research that can be published in open literature pending approval by the ARL Operations Security (OPSEC) Officer. Any information provided in the performance of the duties will remain the property of the U.S. Government and shall not be retained at the conclusion of the assignment to ARL.

- All articles prepared by ARL employees must be reviewed and approved by the responsible supervisor; undergo a security classification, quality assurance, and OPSEC review (ARL Form 1); and be approved for public release (Distribution A: Approved for public release).
- All articles prepared by a contractor or an academician under contract to the U.S. government must be reviewed and approved by his or her Contracting Office Technical Representative; undergo a security classification, quality assurance, and OPSEC review (ARL Form 1); and be approved for public release (Distribution A: Approved for public release).

Q: How will the creation and assignment of any intellectual property be handled?

Under the Bayh-Dole Act, the outside collaborator has first opportunity to file a patent for jointly created inventions. If that party decides that they don't want the "invention," they must notify ARL and then ARL can decide if it would like to go forward and pursue patenting or other means of protecting the intellectual property.

Q: What are government "march-in" rights?

Government march-in rights are one of the most contentious provisions in the Bayh-Dole Act. It allows the funding agency (ARL) to ignore the exclusivity of a patent awarded under the act and grant additional licenses to other "reasonable applicants." This right is strictly limited and can only be used under very specific circumstances. As of 2012, NO FEDERAL AGENCY has ever exercised these rights.

Q: Will any intellectual property (IP) that I bring to the collaboration be protected?

Any IP a non-Federal party brings to the collaboration MAY be protected. The non-Federal party should clearly indicate the proprietary data or property that they are claiming ownership to. ARL may or may not want to protect jointly made IP by filing a patent or other means. The non-Federal party has first election under Bayh-Dole and can file for patent protection. Under all circumstances, non-Federal IP disclosed to Federal employees during the collaboration results in a duty by the Federal employees not to disclose the information (plans, diagrams, etc.) to any non-party to the project.

Q: Does working with a DoD lab affect one's ability to file for a patent?

NO. Working at ARL does not affect your ability to file a patent; however, there will be additional paperwork requirements. The non-Federal party MUST fill out a DD882 report of invention form. ARL would then make a rights determination. Normally the non-Federal party (either solely inventing or jointly with ARL personnel) will have the first opportunity to file for patent protection. The rights the Government will obtain will vary with the instrument (CRDA, Cooperative Agreement, contract, etc.).

Q: What other regulations do I need to know about to work with ARL?

The specific regulations and policies that may apply to any person or group working with ARL will depend on what authority is being used to support the project and/or collaboration. Details concerning the relationship, cost sharing (if applicable), protection of resulting IP, identification and protection of proprietary data, facility/equipment use, and security measures will need to be identified and defined in the implementing agreement.